PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-2

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2011 Survey Report

Mexia Reservoir

Prepared by:

John Tibbs, District Management Supervisor
and
Michael S. Baird, Assistant District Management Supervisor

Inland Fisheries Division
District 2B, Waco, Texas

Carter Smith
Executive Director

Gary Saul
Director, Inland Fisheries

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Mexia Reservoir were surveyed in 2011 using electrofisher and in 2012 using gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Mexia Reservoir is a 1,009-acre impoundment located on the Navasota River within the Brazos River Basin, Limestone County. Water levels were three feet below conservation pool (448.3) during 2011 electrofisher surveys, and five feet above conservation pool during 2012 gill net surveys. Fish habitat at the time of sampling was dominated by natural shoreline, rocky shoreline, rip-rap, bulkhead, and boat docks. Boat access (one ramp) on the reservoir is adequate, yet there are currently no handicap-specific facilities.

- **Management history:** Important sport fish include largemouth bass, white crappie, and catfish. The management plan from the 2007 survey report included stocking and re-evaluation of the blue catfish fishery and conducting aquatic and shoreline habitat surveys in 2011. The most recent fish stocking was fingerling blue catfish in 2008.

- **Fish Community**
  - **Prey species:** Threadfin and gizzard shad were collected at high rates. Other forage species included bluegill, longear sunfish, warmouth, and green sunfish.

  - **Catfishes:** Blue and channel catfish were collected at record rates. Body condition was good to excellent.

  - **White bass:** White bass were collected at rates similar to their historical average. Body condition was good

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  - **Largemouth bass:** Largemouth bass catch rates were below the historical average. Although the size structure indicates a balanced population, few legal-sized fish were observed in the sample. Condition was variable.

  - **White crappie:** White crappie were not surveyed with trap nets in 2011 due to low water levels, however good numbers were observed during 2012 gill net surveys.

- **Management Strategies:** Conduct mandatory electrofisher and trap net sampling in fall 2015 and gill net sampling in spring 2016 (Table 6). A tier IV age and growth analysis will be conducted on crappie in the fall of 2015.

INTRODUCTION

This document is a summary of fisheries data collected from Mexia Reservoir in 2011-2012. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2011-2012 data for comparison.

Reservoir Description

Mexia Reservoir is supplied by the Navasota River within the Brazos River Basin, Limestone County. The reservoir is used as a municipal water supply and for recreation. The 1,009-acre impoundment has a drainage area of 200 square miles, a storage capacity of 10,000 acre-feet, and a shoreline length of 23.4 miles. Mean and maximum depths are 10.0 and 20.0 feet respectively. Water levels were three feet below conservation pool (448.3) during 2011 electrofisher surveys, and five feet above conservation pool during 2012 gill net surveys (Figure 1). Fish habitat at the time of sampling was dominated by natural shoreline, rocky shoreline, rip-rap, bulkhead, and boat docks. Bank fishing is limited to only a few areas on the reservoir. Boat access (one ramp) on the reservoir is adequate, and there are currently no handicap-specific facilities. Other descriptive characteristics for Mexia Reservoir are in Table 1. Further information about Mexia Reservoir and its facilities can be obtained by visiting the Texas Parks and Wildlife Web site at *www.tpwd.state.tx.us* and navigating within the fishing link.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Baird and Tibbs 2007) included:

1. Stocking blue catfish at 100 fingerlings per acre in 2009.
   Action: Blue catfish were requested in 2008 at 100 fingerlings/acre from supplemental hatchery stock, but were actually stocked at 67 fingerlings/acre. No additional stockings were requested in 2009.
2. Performing a gill net survey in 2012 to document blue catfish recruitment. Consider supplemental stockings of blue catfish in 2013 if needed.
   Action: The 2012 gill net survey was completed as scheduled, and blue catfish were collected in record numbers.
3. Conducting an aquatic vegetation and shoreline habitat survey in summer 2011.
   Action: Aquatic vegetation and physical habitat surveys were conducted in summer 2011 and winter 2012; those data are included in this report.

Harvest regulation history: Sportfishes in Mexia Reservoir are currently managed with statewide regulations. The current harvest regulations are listed in Table 2.

Stocking history: Mexia Reservoir has not been stocked since 2008, when blue catfish were stocked at a rate of 67 fish/acre. Earlier blue catfish stockings included 30,000 in 1975 and 140,000 each in 1995 and 1996. Over half a million Florida largemouth bass were stocked into the reservoir between 1974 and 1998. The complete stocking history is in Table 3.

Vegetation/habitat history: Mexia is a shallow, turbid reservoir with a secchi range less than two feet. A full vegetation survey conducted in summer 2011 found dominant shoreline vegetation to be cutgrass (*Leersia spp.*) covering 61.8 acres, bulrushes (*Scirpus spp.*) covering 56.5 acres, and water willow (*Justicia americana*) covering 6.2 acres. No noxious species of vegetation have been identified in the reservoir to date.

Water Transfer: Mexia is primarily used for municipal water supply and recreation. The Bistone Municipal Water Supply District (BMWSD) has the only raw water intake structure on the reservoir which transfers water offsite. The District currently transfers water from Lake Mexia during peak water demand events. For example, the District transferred 47.133 million gallons of water in five months during 2011. There are currently no additional water transfers being considered.

Reservoir capacity: Mexia was impounded in 1961. Original plans calculated the reservoir's capacity at conservation pool (448.3 feet above mean sea level) to be 10,000 acre-feet with a surface area of 1,200 acres. Two volumetric surveys have been conducted by the Texas Water Development Board (TWDB) on Mexia since impoundment; one in 1996 and one in 2008. The 2008 survey found a volume of 4,687 acre-feet and a surface area of 1,009 acres at conservation pool elevation. According to the TWDB, Lake Mexia has accumulated 1,021 acre-feet of sediment volume, which equates to a loss of roughly 22 acre-feet of volume each year since impoundment. Additional information can be found at the following web link: http://www.twdb.state.tx.us/hydro_survey/Mexia2008/Mexia2008_FinalReport.pdf

METHODS

Fishes were collected by electrofisher (1 hour at 12 5-min stations) and gill nets (5 net nights at 5 stations). The 2011 tier IV age and growth trap net survey was cancelled due to low water levels and no access. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and, for gill nets, as the number of fish caught per net night (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD)], as defined by Guy et al. (2007), and condition indices [relative weights (Wr)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. No age and growth was conducted in 2011-2012. Source for water level data was the United States Geological Survey (USGS) website.

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consisted primarily of natural shoreline, rocky shoreline, rip-rap, bulkhead, and boat docks. Aquatic vegetation and physical habitat surveys were conducted in summer 2011 and winter 2012 (Table 4).

Creel: No creels were performed on Mexia Reservoir in the last four years.

Prey species: Threadfin and gizzard shad were collected by electrofisher at 1379.0/h and 1432.0/h respectively in 2011, and these catch rates are higher than the historical averages for both species. The Index of vulnerability (IOV) for gizzard shad was excellent as 98% of gizzard shad were available to existing predators as forage. Other important forage species collected were bluegill (186/h), longear sunfish (47.0/h), warmouth (5.0/h), and green sunfish (5.0/h). Panfish seldom reach preferred size classes in Mexia Reservoir. (Figures 2 and 3; Appendices A and B).

Catfishes: Blue catfish were collected with gill nets at 2.8/nn in 2012; this catch rate equates to 14 collected individuals, and is the highest catch rate on record. Proportional size distribution values have been inconsistent over the past three surveys indicating unstable recruitment, growth, or mortality. The

increased catch rate observed in 2012 probably represents individuals stocked in 2008 which have recruited to the sampling gear. Although most sampled blue catfish were legal size, individuals fell well short of the preferred size category of 30 inches. Body condition was good (Figure 4; Appendices A and B).

Channel catfish were collected with gill nets at 15.2/nn in 2012; this catch rate equates to 76 collected individuals, and is the highest catch rate on record. Proportional size distribution values have remained good over the past three surveys indicating balanced recruitment, growth, and mortality. Most channel catfish sampled were legal size, and good numbers approached the preferred size category of 24 inches. Body condition was excellent, and improved with increasing lengths (Figure 5; Appendices A and B).

White bass: White bass were collected with gill nets at 1.4/nn in 2012; this catch rate equated to 7 collected individuals, and was below the historical average for the species. The PSD for white bass has remained at 100 for the past three surveys, indicating a population skewed towards larger individuals, and poor recruitment, possibly due to poor connectivity with the Navasota River which feeds the reservoir, or poor spawning habitat in the river. Body condition was good (Figure 6; Appendices A and B).

Largemouth bass: Largemouth bass were collected by electrofisher at 40/h in 2011; this catch rate equates to 40 collected individuals, and was below the historical average. Proportional size distribution was good, illustrating a balanced population. The proportion of individuals 14-inches and larger was 21, indicating fair numbers of harvestable bass for anglers. Body condition was average with Wrs averaging between 90 and 100 for most size classes. Largemouth bass genetics were last analyzed in 2003 and showed relatively poor Florida influence (25%) (Figure 7; Table 5; Appendices A and B).

White crappie: A comprehensive age and growth survey of white crappie was scheduled for winter 2011 but could not be conducted due to low water levels, however white crappie were collected at 6.6/nn during spring 2012 gill net surveys. Population indices (PSD and PSD-10) from this survey were high, indicating stable recruitment, growth, and mortality, and excellent numbers of harvestable crappie for anglers. Body condition was good to excellent (Figures 8 and 9; Appendices A and B).

Fisheries management plan for Mexia Reservoir, Texas

Prepared – July 2012.

ISSUE 1: The gill net catch rate of channel catfish is the highest on record for the reservoir.

MANAGEMENT STRATEGIES

1. Release one or more news articles showcasing the excellent channel catfish angling opportunities on Mexia Reservoir.
2. Update the Texas Parks and Wildlife Department's website to reflect the most recent fish species data for Mexia Reservoir.

ISSUE 2: Recent studies indicate Mexia Reservoir could be losing as much as 218 acre-feet of volume each year through erosion and sedimentation from within its watershed. This relatively rapid loss of fisheries habitat is the single most important issue facing Mexia's fishery. Other federal and state agencies are already actively engaged in this issue – although for reasons not concerning fish and wildlife.

MANAGEMENT STRATEGIES

1. Share information on Mexia with the TPWD watershed coordinator, Gary Garrett, along with TPWD partnerships such as the Southeastern Aquatic Resources Partnership (SARP), and Reservoir Fisheries Habitat Partnership (RFHP).
2. Propose funding from SARP and RFHP to perform best management practice (BMP) work within this watershed, based on its relative small size (198 square miles), and the fact that it's one of at least four major reservoirs within the Black land Prairie Ecological Region severely affected by erosion and sedimentation (Aquilla, Fort Parker, and Limestone).

ISSUE 3: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. Giant Salvinia (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir when they become available.
2. Educate the public about invasive species through the use of media and the internet when appropriate.
3. Make a speaking point about invasive species when presenting to constituent and user groups. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes standard electrofisher and tier IV age and growth trap net sampling in fall 2015 and gill net sampling in spring 2016 (Table 6). A tier IV age and growth analysis will be conducted on crappie in the fall of 2015.

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DiCenzo, V. J., M. J. Maceina, and M. R. Stimert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.

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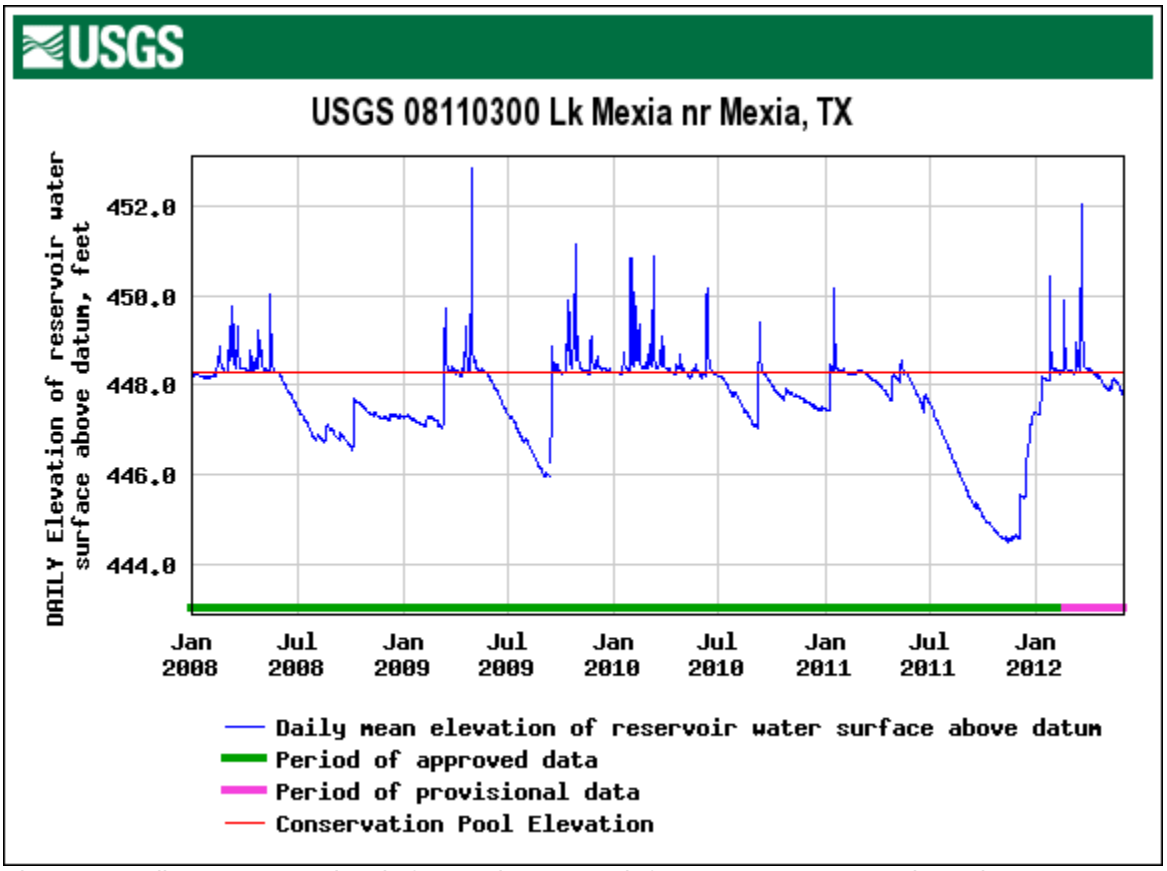


Figure 1. Daily mean water levels for Mexia Reservoir from January 1, 2008 through June 1, 2012. Conservation pool level is 448.3 feet above mean sea level. Figure from USGS website.

Table 1. Characteristics of Mexia Reservoir, Texas.

Characteristic	Description
Year Constructed	1961
Controlling authority	Bistone Municipal Water District
County	Limestone
Reservoir type	Tributary
Shoreline Development Index (SDI)	8.0
Conductivity	280 umhos/cm

Table 2. Harvest regulations for Mexia Reservoir.

Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	25 (in any combination)	12 - No Limit
Catfish, Flathead	5	18 - No Limit
Bass, White	25	10 - No Limit
Bass: largemouth	5	14 – No limit
Bass: spotted	5 (in any combination)	No Limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No Limit

Table 3. Stocking history of Mexia, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adults (ADL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined.

Species	Year	Number	Life Stage	Mean TL (in)
Blue catfish	1975	30,000	UNK	UNK
	1995	140,000	FGL	1.9
	1996	140,000	FGL	1.9
	2008	60,061	FGL	2.0
	Total	370,061		
Flathead catfish	1969	3,806		UNK
	Total	3,806		
Florida Largemouth bass	1974	63,745	FGL	2.2
	1974	11,375	FRY	1.0
	1976	70,000	FRY	1.0
	1977	140,340	FRY	1.0
	1995	142,384	FGL	1.3
	1998	140,668	FGL	1.3
	Total	568,512		
Green sunfish x redear sunfish	1980	1,000		UNK
	Total	1,000		
Largemouth bass	1996	43	ADL	12.0
	Total	43		

Table 4. Survey of littoral zone and physical habitat types, Mexia Reservoir, Texas, 2011-2012. Linear shoreline distance (miles) and percent of linear shoreline distance was recorded for each habitat type greater than one percent; otherwise noted as trace. Percent of total shoreline distance is blank for boat docks/piers because they were dually coded with adjacent habitat; counts are given instead. Survey was conducted using 2010 NAIP, 1-meter resolution satellite imagery.

	Shoreline Distance	
Shoreline habitat type	Miles	Percent of total
Natural shoreline	19.9	85.1
Rock shoreline (rocks > 4”)	1.6	6.6
Bulkhead	1.9	8.3
Boat docks/piers		N=142

Gizzard Shad

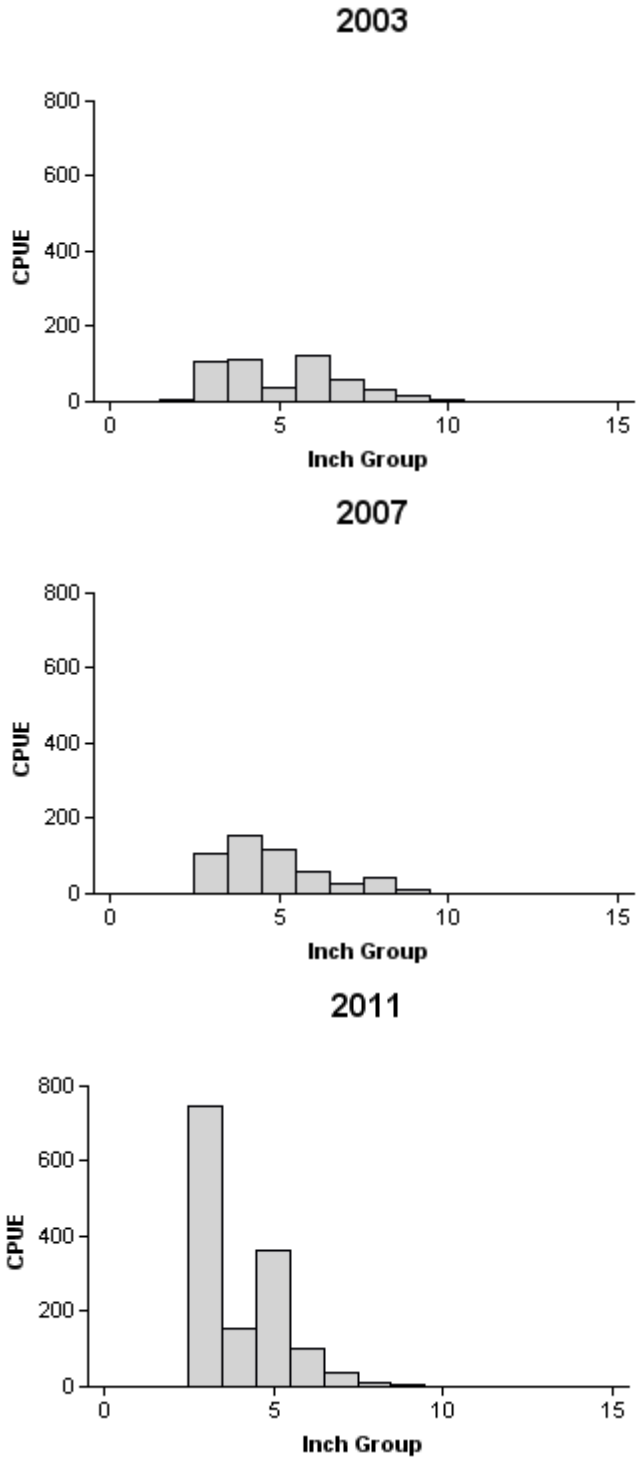


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Mexia Reservoir, Texas, 2003, 2007, and 2011.

Bluegill

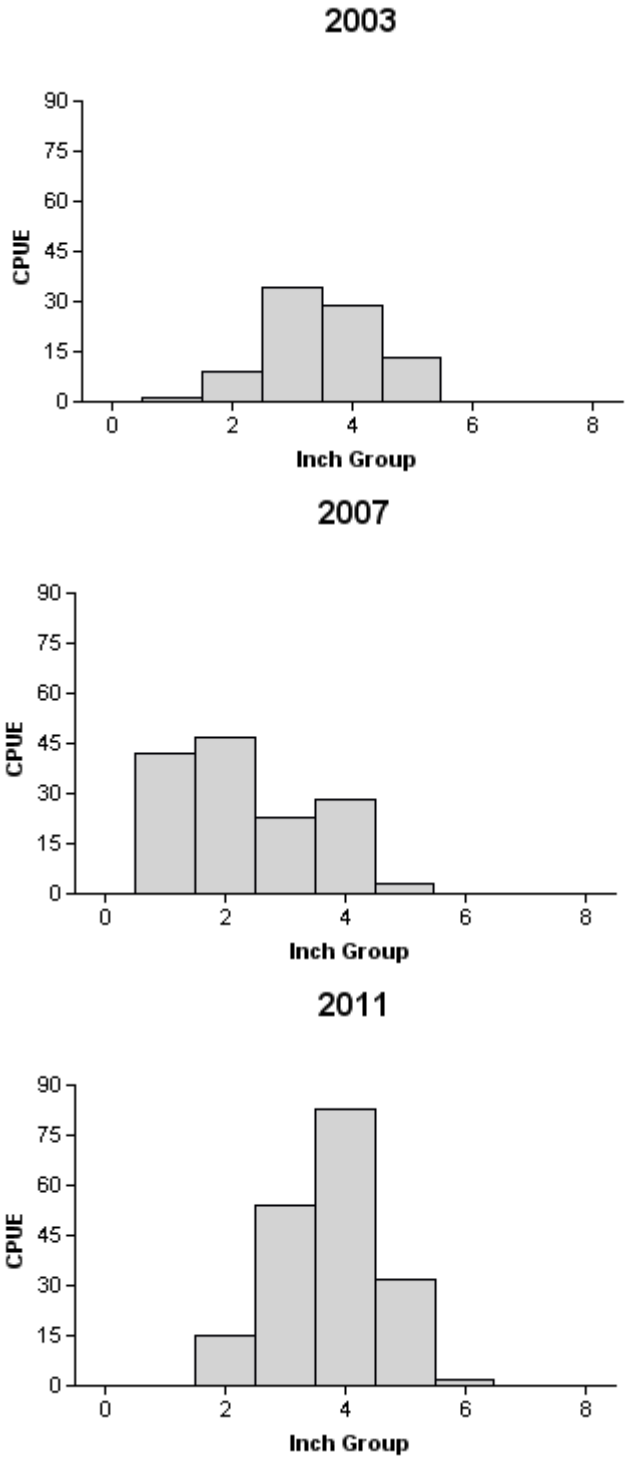


Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Mexia Reservoir, Texas, 2003, 2007, and 2011.

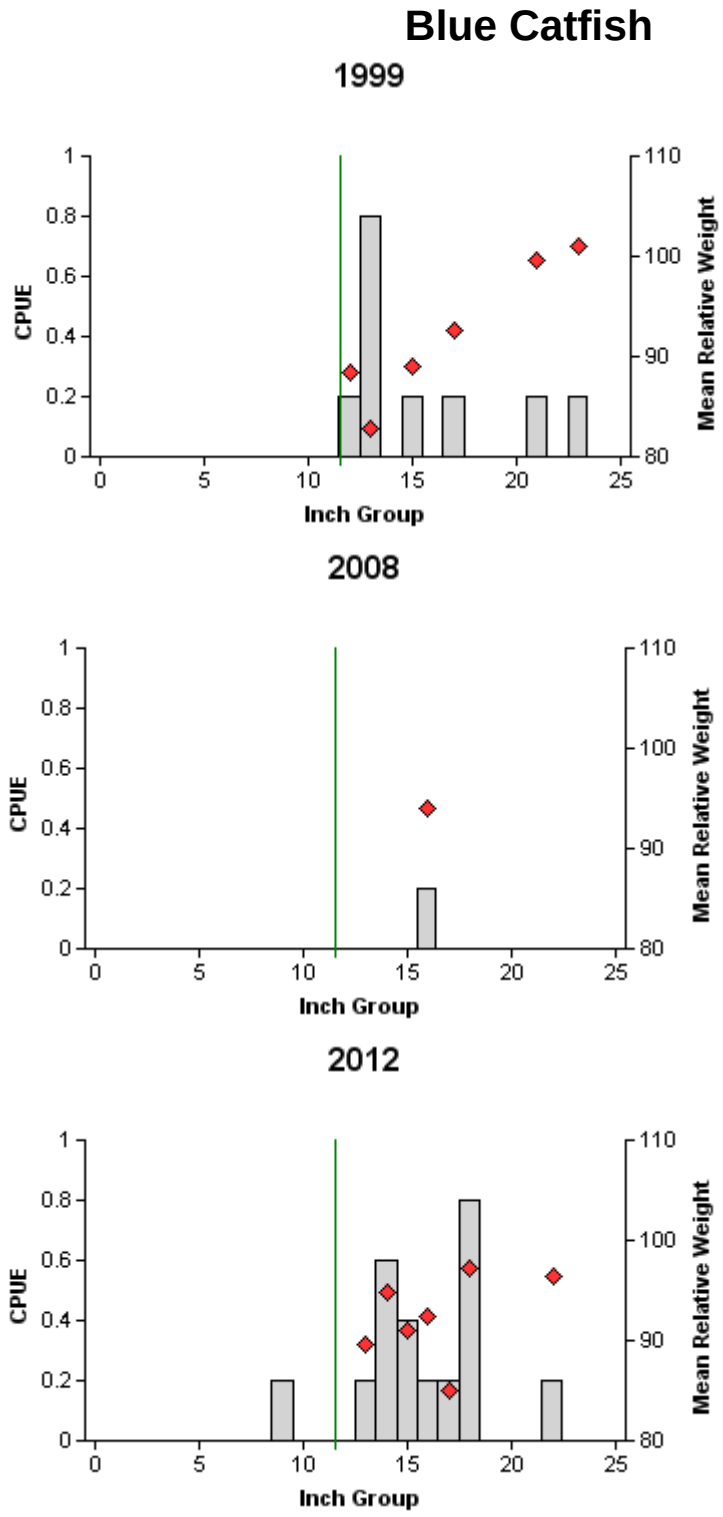


Figure 4. Number of blue catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Mexia Reservoir, Texas, 1999, 2008, and 2012. No blue catfish were collected in 2004 gill net surveys.

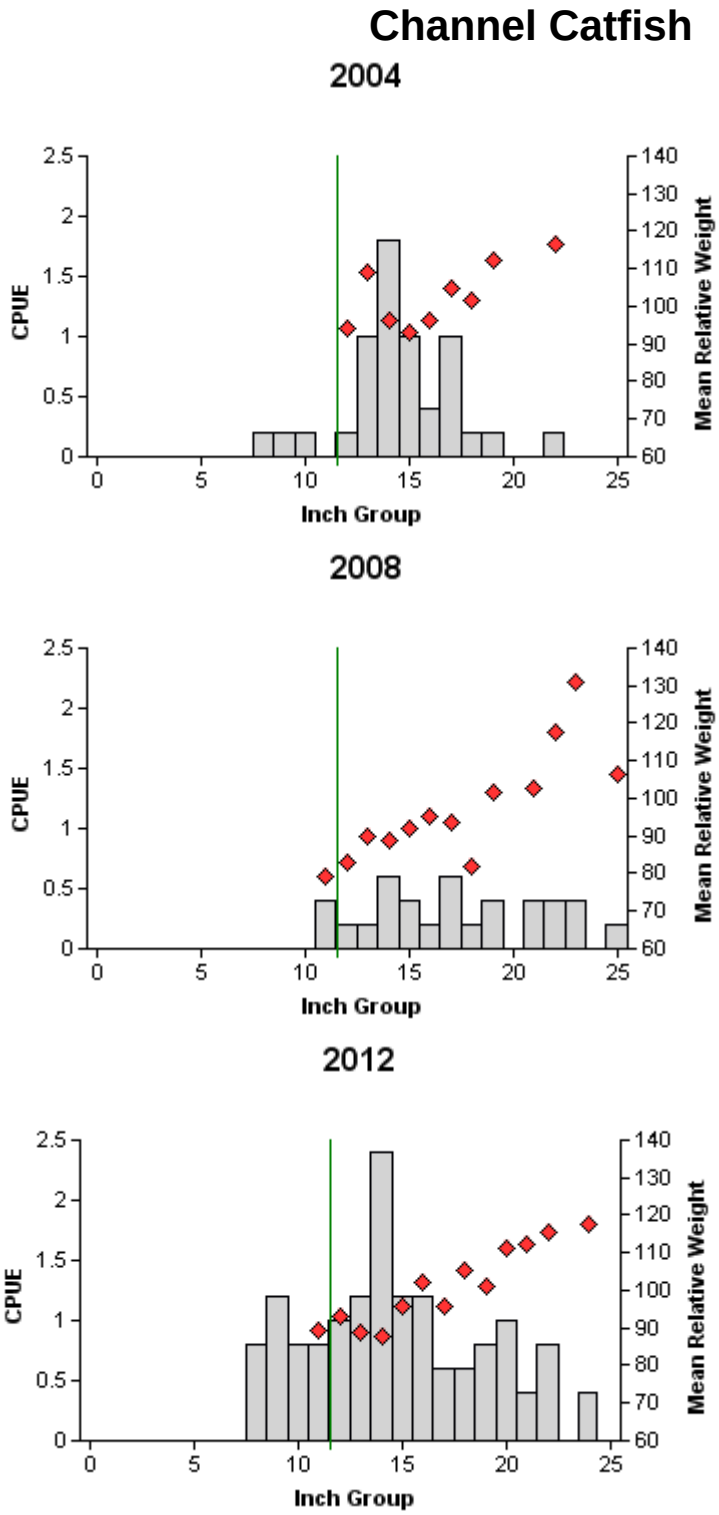


Figure 5. Number of channel catfish caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Mexia Reservoir, Texas, 2004, 2008, and 2012.

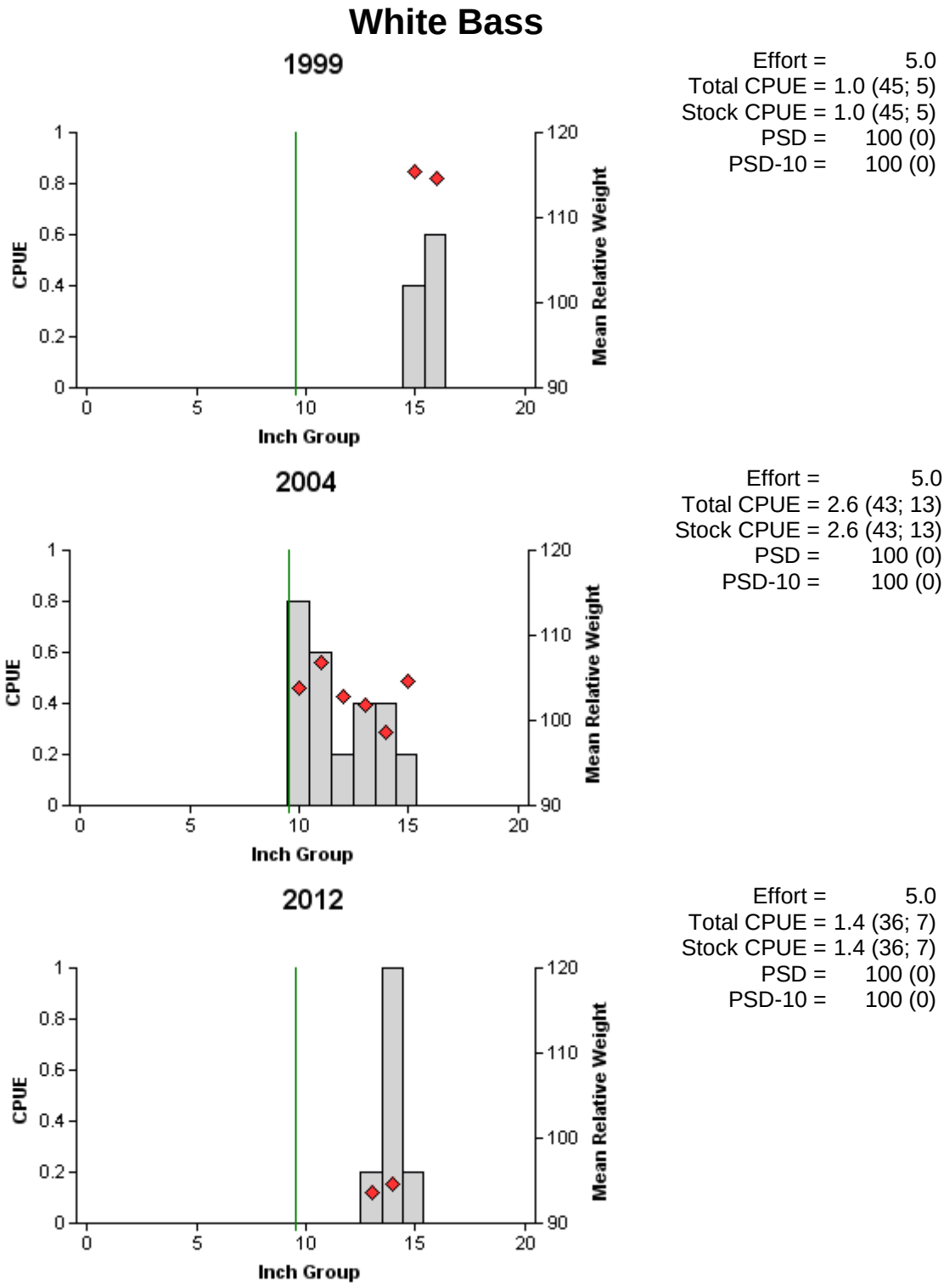


Figure 6. Number of white bass caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Mexia Reservoir, Texas, 1999, 2004, and 2012. No white bass were collected in 2008 surveys.

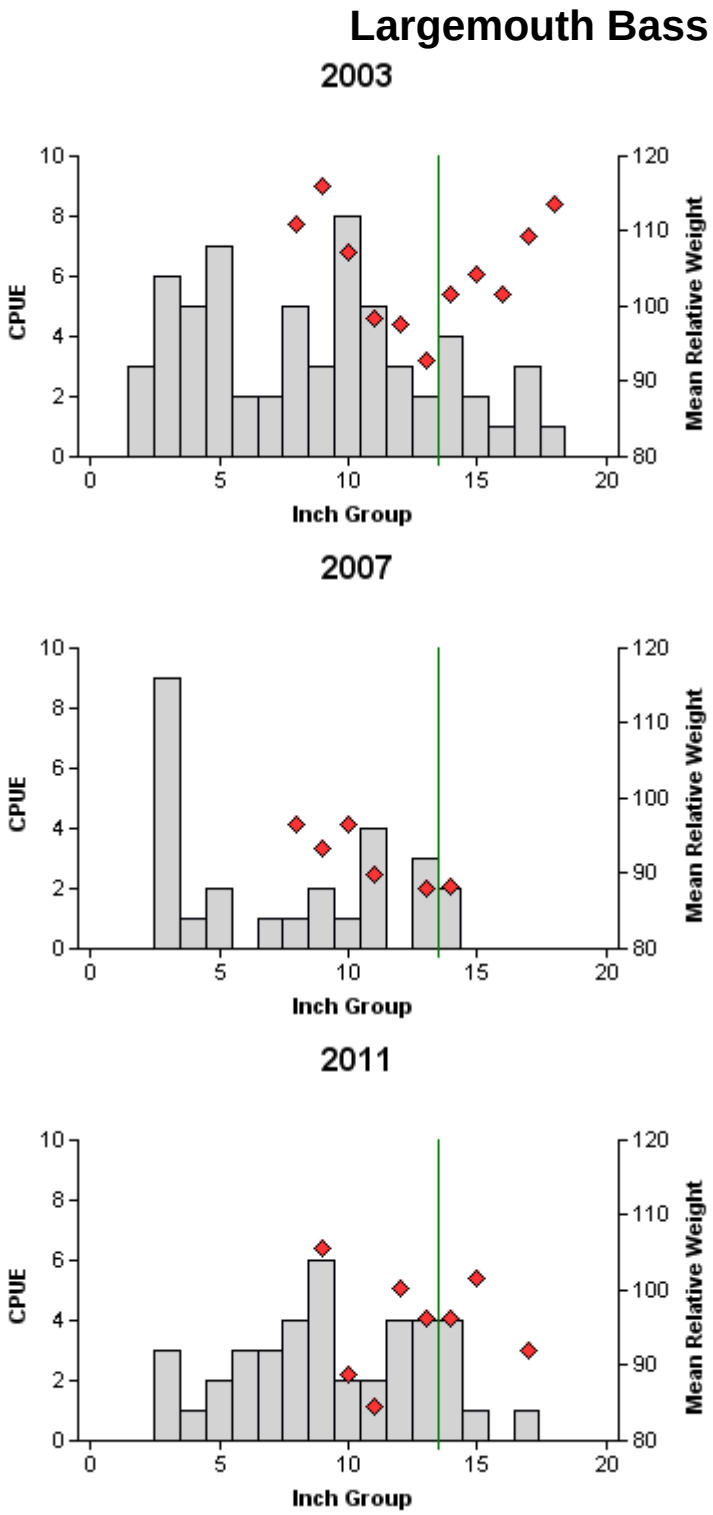


Figure 7. Number of largemouth bass caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Mexia Reservoir, Texas, 2003, 2007, and 2011.

Table 5. Results of genetic analysis of largemouth bass collected by fall electrofishing, Mexia Reservoir, Texas, 1999 and 2003. Analysis conducted prior to 2004 are based on allozyme testing, while later analyses are based on microsatellite DNA testing. Genetic information was not collected during the 2011 electrofishing season. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, Hybrid = bass with both FLMB and NLMB alleles.

		Genotype				
Year	Sample size	%FLMB	%Hybrid	%NLMB	% FLMB alleles	% Northern alleles
1999	28	0	64	36	28	72
2003	30	4	52	44	25	75

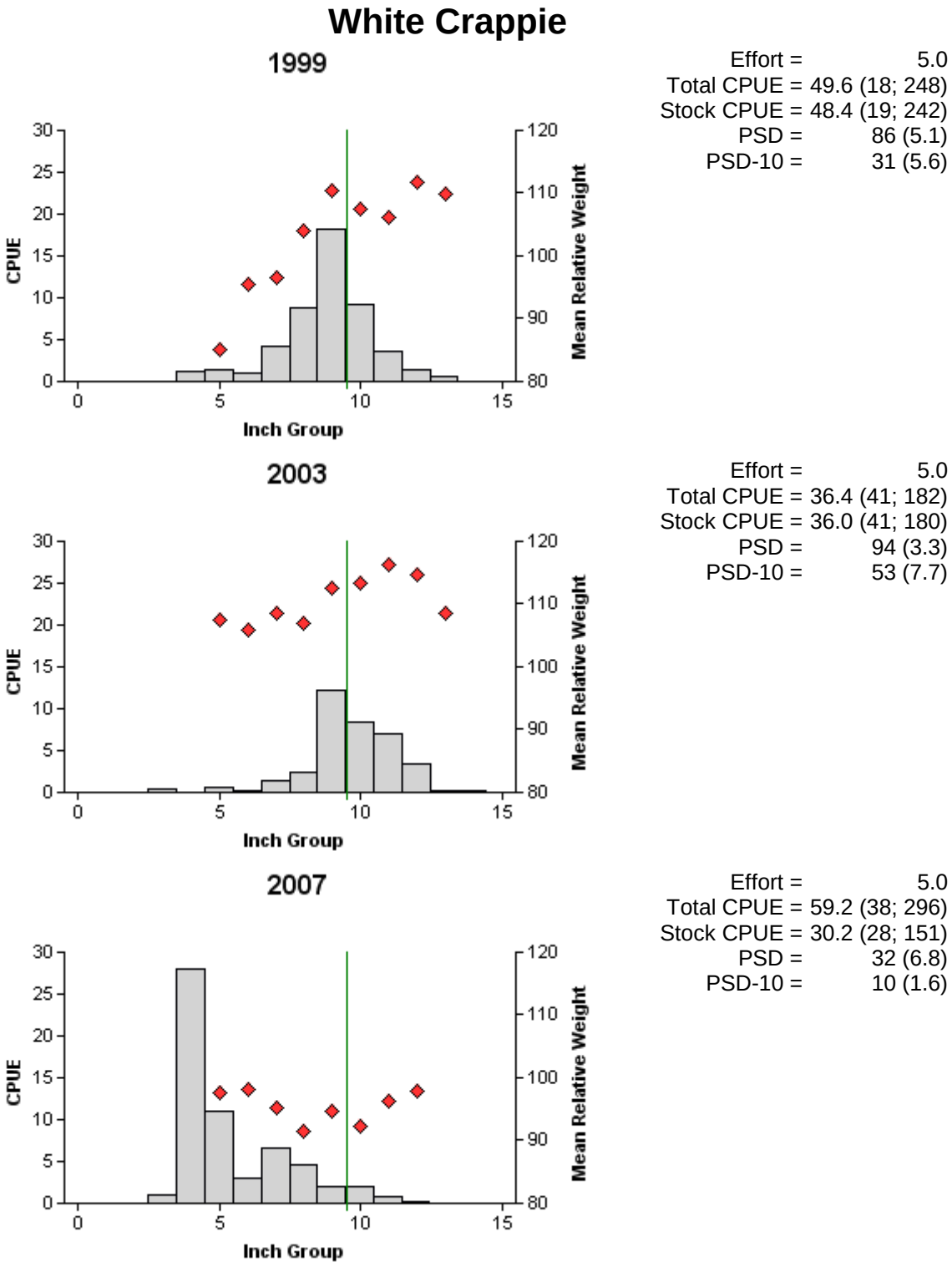
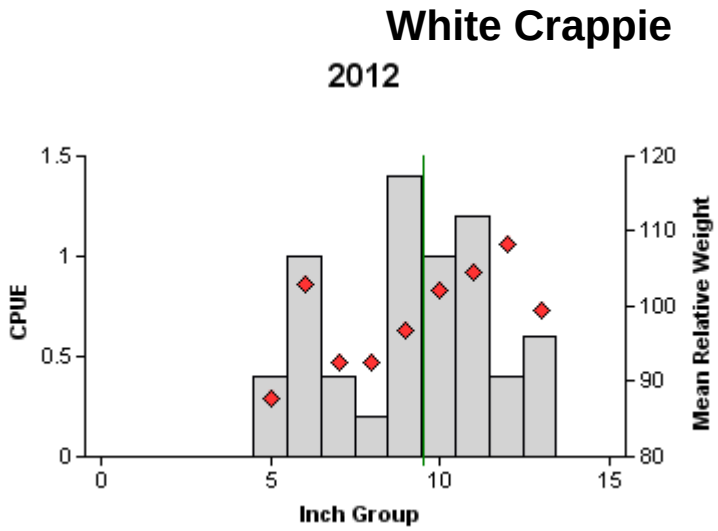


Figure 8. Number of white crappie caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Mexia Reservoir, Texas, 1999, 2003, and 2007. Trap netting was not conducted in fall 2011 due to low water.



Effort = 5.0
Total CPUE = 6.6 (24; 33)
Stock CPUE = 6.6 (24; 33)
PSD = 73 (14.4)
PSD-10 = 48 (15.6)

Figure 9. Number of white crappie caught per net night (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill netting, Mexia Reservoir, Texas, 2012. Trap netting was not conducted in fall 2011 due to low water.

Table 6. Proposed sampling schedule for Mexia Reservoir, Texas. Gill net surveys are conducted in the spring, vegetation and access surveys are conducted in the summer, and electrofisher and trap net surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

Survey Year	Electrofisher	Trap Net	Gill Net	Vegetation Survey	Access Survey	Creel Survey	Report
Fall 2012-Spring 2013							
Fall 2013-Spring 2014							
Fall 2014-Spring 2015							
Fall 2015-Spring 2016	S	S	S	S	S		S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Mexia Reservoir, Texas, 2011-2012. Asterisk denotes collection by a non-standard gear.

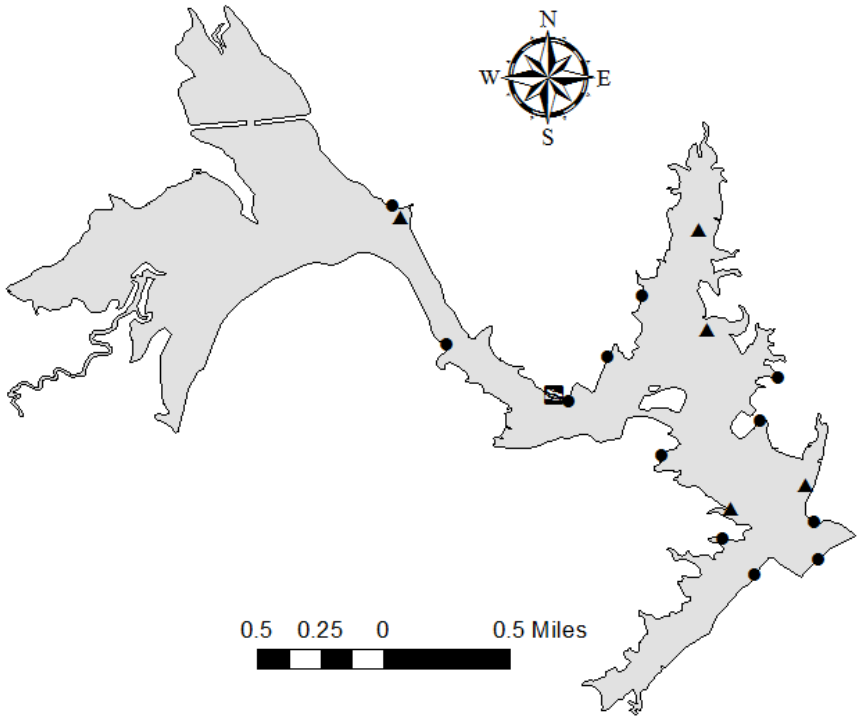
Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard shad			1,432	1,432.0
Threadfin shad			1,379	1,379.0
Blue catfish	14	2.8		
Channel catfish	76	15.2		
White bass	7	1.4		
Warmouth			5	5.0
Green sunfish			5	5.0
Bluegill			186	186.0
Longear sunfish			47	47.0
Largemouth bass			40	40.0
White crappie*	33	6.60		

APPENDIX B

Historical catch rates (CPUE) of targeted species by gear type for standard surveys on Mexia Reservoir, Texas, 1996 to present. All stations were randomly selected. Electrofishing stations were shocked with a 5.0 Smith-Root GPP (Gas Powered Pulsator) until 2010, when a 7.5 Smith-Root GPP began being used. Species averages are in bold. Asterisk denotes collection by a non-standard gear.

Gear	Species	1996	1999	2003	2004	2007	2008	2011	2012	Avg.
Electrofisher										
	Largemouth bass	61.3	109.0	62.0		26.0		40.0		**59.7**
	Gizzard shad	1759.0	107.0	505.0		519.0		1432.0		**864.4**
	Threadfin shad	256.0	0.0	2007.0		18.0		1379.0		**732.0**
	Bluegill	23.3	89.3	86.0		143.0		186.0		**105.5**
	Longear sunfish	8.7	91.3	10.0		20.0		47.0		**35.4**
	Green sunfish							5.0		**5.0**
	Warmouth	4.7	2.7	1.0		4.0		5.0		**3.5**
Gill nets										
	Blue catfish	0.0	1.8		0		0.2		2.8	**0.96**
	Channel catfish	4.0	1.6		6.6		4.8		15.2	**6.44**
	White bass	5.0	1.0		2.6				1.4	**2.0**
Trap nets										
	White crappie	38.8	49.6		36.4	59.2			*6.6	**46.0**

APPENDIX C



Location of sampling sites, Mexia Reservoir, Texas, 2011-2012. Standard electrofisher and gill net stations are indicated by circles and triangles respectively. Water levels were three feet below conservation pool (448.3) during 2011 electrofisher surveys, and five feet above conservation pool during 2012 gill net surveys.